DESIGN OF MANUFACTURING PROCESS FOR A PART FOR INFORMATION TECHNOLOGY

Edwin Divakaran Maria Selvaraj
Prof. Jeremy (Zheng) Li
UB Mechanical Engineering
University of Bridgeport, Bridgeport, CT

ABSTRACT:

The paper seeks to manufacture a part for mass communication (fig I.2) with low cost, less complication and more quality by reducing the labours and skill level, increasing the speed of the process, and without using any sensors

I.INTRODUCTION

In the ongoing industrial development, in the manufacturing sector seeks towards the automation of machining sequence to reduce the labour cost, energy usage, reduce wastage and to improve the quality. But in many cases complete automation becomes reluctant because the industry has to install many sensors and computers which lead to chaos. So it is ideal to go with semi-automation with the minimum usage of labour and not using the sensors and computers, CNC lathe and programming. By making a labour to do a same work repeatedly process will require only less numbered artisan labours which makes the less labour cost for the product. The project concerns with designing the best manufacturing sequence for the the following product (fig I.2) from the given raw material (fig I.1). The part is used in the mass communication technology.

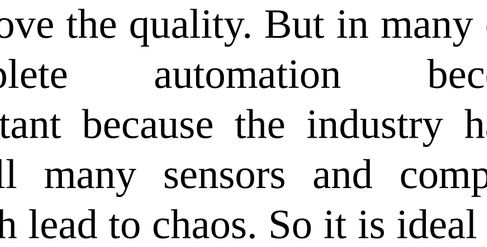


Fig I.1 Raw Material(8” x 4” x 1” cuboid)

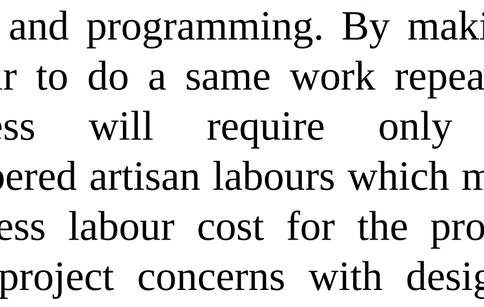


Fig I.2 Final Product with dimensions

FIXTURE DESIGN

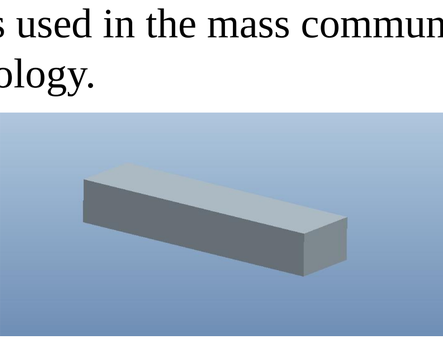


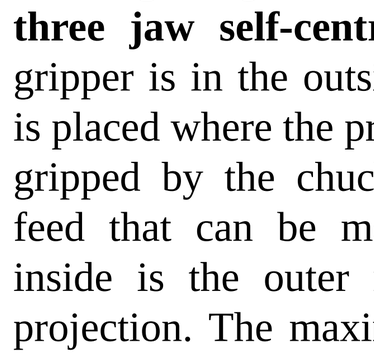
Fig I.3 Newly designed of fixture

EXPLANATION/DISCUSSION OF EACH PROCESS

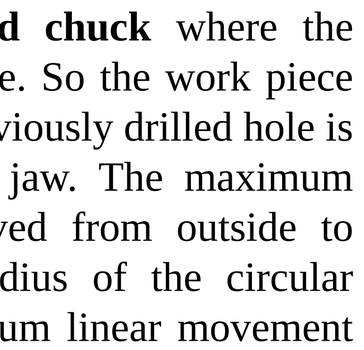
PROCESS 1: The first process is the **drilling** in the centre of the cuboid. For this process the **self-centred bench-vice** is used as the fixture (fig …). The fixture will be fixed to the table of the drilling machine and its fixed exactly centre of the table so that the driller comes to touch exactly at centre of the raw material’s top face. By placing the work piece and pulling the pin, work piece is aligned exactly to the centre so no measurement is required. As the size of the drill bit is same as the required hole so no radius measurement is needed.

PROCESS 2: The second process is the **Turning** using Lathe. The fixture used is the **three jaw self-centred chuck** where the gripper is in the outside. So the work piece is placed where the previously drilled hole is gripped by the chuck jaw. The maximum feed that can be moved from outside to inside is the outer radius of the circular projection. The maximum linear movement is the length of the projection.

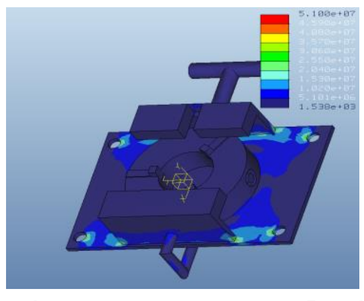
PROCESS 3: The third process is the process of **shaping**. Part along with the fixture reaches the shaper station. The fixture is placed in the table as like the four columns enters into the holes in the corners of the fixture. The shaper is allowed to cut the centre slot then the work piece is moved by pushing a lever the side slot is cut and then the lever is pulled to cut the second side slot.



FigII.1: Position of piece along with fixture

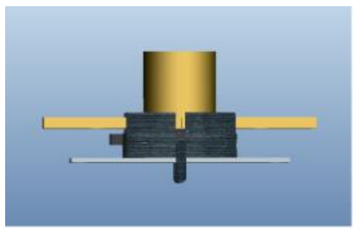


FigII.2: Table for Shaper

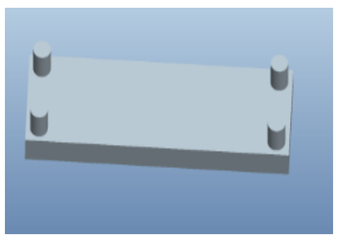


FigII.3: FEA analysis of fixture while cutting

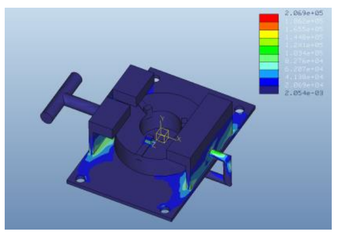
Process 4: The fourth process is the **milling**. Place the part with fixture flat over the table. Here the table is the round table so the cut can be done radially in pre-fixed angle. Similar to previous machining the table is moved to next position to cut the curvature at the other end.



FigII.4: Position for milling

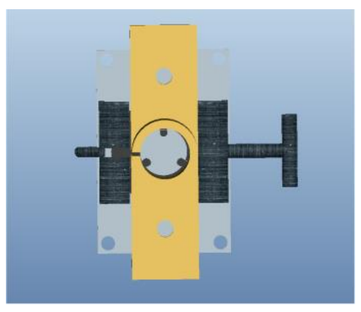


FigII.5: Table for milling

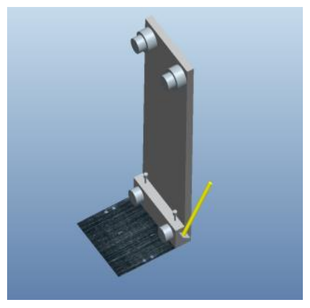


FigII.6: FEA of Fixture while milling

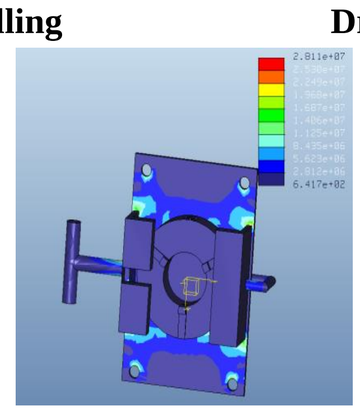
PROCESS 5: The fifth and last process is the **drilling** in the ears of the part. The same part with fixture is put over the table as shown below and drilled at a point then pushed to other side then drill other hole.



FigII.7: Position for Drilling



FigII.8: Table for Drilling



FigII.9: FEA of Fixture while drilling

CONCLUSION

Industrial manufacturing plays a main role in determining the cost of the product, so an engineer has to design the best way to manufacture a product. Industry can manufacture a product without any need for measurement at any point of time. So for a manufacturing without any technical assistance does not want any skilled labours. By calculating the time taken at each station and installing the number of machines accordingly. This may be the best way to manufacture this part with less number of labours, cheapest and with high quality.